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EXAMINER	
STAHL, MICHAEL J	

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 01/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/033,549	POLYNKIN ET AL.	
	Examiner	Art Unit	
	Mike Stahl	2874	

-- Th MAILING DATE of this communication app ars on th cov r sh t with the correspond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 July 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disp sition of Claims

4)☒ Claim(s) *1-29,31,32,35 and 36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29,31,32,35 and 36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5/30/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

This office action is in response to the amendment filed July 17, 2003. The changes to the claims have been entered. Claims 1-29, 31-32, and 35-36 are pending.

Oath/Declaration

The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02. This was noted in the last office action.

> The oath or declaration is defective because:
> It does not identify the mailing or post office address of each inventor. A mailing or post office address is an address at which an inventor customarily receives his or her mail and may be either a home or business address. The mailing or post office address should include the ZIP Code designation. The mailing or post office address may be provided in an application data sheet or a supplemental oath or declaration. See 37 CFR 1.63(c) and 37 CFR 1.76.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 7-11, 32, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solgaard et al. (US 6097859) in view of Tobias (US 5483335).

Solgaard discloses an apparatus (fig. 8) comprising an input port (which includes fiber **68**), a wavelength disperser **70**, an array **74** of beam-manipulating elements positioned to correspond with the dispersed channels, and an optical detector **78**. The beam-manipulating elements are operable in a time-division-multiplexed manner (col. 9 lines 10-12 and 21-27).

Solgaard does not disclose an array of optical detectors including a plurality of detectors each corresponding to a unique spectral channel. However, it is already known in the art to use an individual detector for each spectral channel. Tobias teaches that array detectors are advantageous over single detectors for spectroscopy because they enable analysis of multiple wavelengths simultaneously instead of sequentially, and have an increased signal-to-noise ratio (col. 4 lines 40-50). Thus it would have been obvious to a skilled person at the time the invention was made to modify the Solgaard apparatus by including additional photodetectors in an array in order to achieve the benefits taught by Tobias. The apparatus modified as just proposed satisfies claim 1, and the method of using it satisfies claim 32.

As to claims 2-4 and 35, the beam-manipulating elements are micromirrors, are fabricated from silicon, and are pivotable about at least one axis (additional details of the micromirrors are shown in figs. 2 and 3 and are described at col. 4 lines 28-36 and col. 6 line 57 – col. 7 line 49).

As to claim 7, the disperser **70** is a diffraction grating.

As to claim 8, the detector **78** is referred to as a photodiode detector, so it is believed to be either a PN or PIN type device. In the proposed modification, an array of such detectors is used.

As to claim 9, the input port includes a fiber collimator (see element **26** in fig. 1) and a fiber **68**. As to claim 10, the fiber is a single mode fiber (Table 1).

The apparatus includes a beam-focuser **72** for focusing the spectral channels onto corresponding spots on the beam-manipulating elements, as required by claim 11.

Claims 18-21, 24-29, 31, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solgaard et al. in view of Tobias as applied above, further in view of Braun et al. (US 6177992).

The Solgaard apparatus modified in accordance with the teachings of Tobias, as proposed above with regard to claims 1 and 32, possesses all the features of claims 18 and 36 except for a polarization separator and a polarization rotator. The input optical signals in Solgaard appear to be limited to a single polarization, and the only treatment pertaining thereto is the inclusion of quarter wave plates to compensate for the polarization sensitivity of the gratings. Solgaard does not specifically discuss handling input signals of more than one polarization. However, optical communication systems using orthogonal polarizations are already known in the art.

Braun discloses an arrangement for handling input signals having orthogonal polarizations. The arrangement includes a polarization separator **12** to split an input signal **11** into first and second polarization components, and a polarization rotator **14** to rotate the second component by 90 degrees (fig. 1). The purpose of the arrangement is to change one of the polarization components so that both components are compatible with the grating **16** (col. 1 lines 46-50). Braun also notes that the arrangement is useful for spectral monitoring applications (col. 2 lines 1-5; col. 3 lines 18-22; col. 4 lines 16-19).

Thus Braun teaches a way to overcome a limitation that is present in the Solgaard system modified as taught by Tobias, namely, the polarization sensitivity of the grating **70**. It would have been obvious to a person having ordinary skill in the art to apply the polarization separator and rotator taught by Braun to the already-modified Solgaard arrangement in order to enable the use of two polarizations, which would in turn beneficially increase the signal handling capacity

of the Solgaard system. It would further have been obvious to a skilled person to use a separate detector for each polarization component, since it is well known that certain elements of optical fiber communication systems affect different polarization components in differing magnitudes, and accordingly it would be useful to track the effects on each polarization component individually. It is noted that using multiple detectors to cover each polarization component is identical in principle to what Tobias already teaches with respect to simultaneous wavelength detection. These proposed further modifications of Solgaard satisfy claims 18, 29, and 31, and the method of using the further-modified system satisfies claim 36.

Claims 19-21 and 26-28 are satisfied by the Solgaard device alone as described above, and would still be satisfied under the proposed combinations.

As to claim 24, the polarization separator **12** taught by Braun is a polarization beam splitter (col. 2 lines 8-13). As to claim 25, the polarization rotator **14** may be a half wave plate (claim 6).

Claims 12-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solgaard et al. in view of Tobias as applied above, further in view of Saunderson (US 3090278).

As to claim 12, Solgaard does not disclose a reference signal and a reference position-sensing element. However, it is well known that gratings such as the grating **70** in Solgaard need to be precisely aligned for proper operation and that ambient conditions (e.g. temperature changes) can cause misalignment. Solgaard does not provide any means for correcting and maintaining the alignment of grating **70**.

Saunderson discloses a spectrometer system. In the fig. 2 embodiment, a reference signal ("monitor radiation") of a particular wavelength is applied to the input port along with other wavelength signals (see also claim 1). The reference signal is diffracted from the grating **28** and propagates to a position-sensing element which includes elements **94-110**. The photomultiplier tubes **102** and **104** generate drive signals for a servo motor **48** that controls the alignment of the grating (fig. 1). The drive signals are representative of the grating position as described at col. 3 lines 29-51.

The overall alignment technique taught by Saunderson is clearly applicable to the spectrometer disclosed in fig. 8 of Solgaard. It would have been obvious to a skilled person to further modify the Solgaard/Tobias combination in the manner suggested by Saunderson by providing a reference wavelength signal, a position detector for that signal, and a servo device responsive to the position detector for controlling the position of grating **70** in order to maintain correct alignment of the grating with respect to the other components of the arrangement. The proposed further modification would have satisfied the requirements of claims 12, 13, 15, and 17.

As to claim 14, in the proposed modification the arrangement would inherently include an optical combiner since there must be some way of getting the reference wavelength signal into the input fiber **68**.

As to claim 16, since the reference wavelength signal would be diffracted from grating **70** along with all the other input wavelength signals, and since the other signals are already incident on the beam-manipulating elements **74**, it would have been obvious to a skilled person to locate the position-sensing element with the beam-manipulating elements **74** for simplicity. It is noted

that Saunderson places the position-sensing elements in the same array as the exit slits (such as **34** in fig. 1), and the exit slits essentially correspond to the beam-manipulating elements **74** of Solgaard. Moreover, although Saunderson teaches adjustment of the grating position, a skilled person would have understood that the grating could be fixed while the slit / PMT array is moved. Thus in the combination proposed above it would have been obvious to such a person to fix the grating position while rotating the element array **74**. One motivation for this alternative arrangement is that the array **74** is larger than the grating and would be more susceptible to misalignments resulting from temperature changes.

Claims 1-7, 32, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stafford (US 5504575) in view of Tobias (cited above).

Stafford discloses an apparatus (fig. 3) including an input port (e.g. via slit **60**), a wavelength-disperser **80** that splits the input signal into a number of spectral channels, an array of beam-manipulating elements **93** positioned to correspond to the channels, and a detector **100**. The beam-manipulating elements are individually controllable and can direct the channels into the detector in a time-division-multiplexed sequence (col. 4 lines 39-44).

Stafford does not disclose an array of optical detectors including a plurality of detectors each corresponding to a unique spectral channel. However, it is already known in the art to use an individual detector for each spectral channel. Tobias teaches that array detectors are advantageous over single detectors for spectroscopy because they enable analysis of multiple wavelengths simultaneously instead of sequentially, and have an increased signal-to-noise ratio (col. 4 lines 40-50). Thus it would have been obvious to a skilled person at the time the

invention was made to modify the Stafford apparatus by including additional photodetectors in an array in order to achieve the benefits taught by Tobias. The modified Stafford apparatus satisfies claim 1, and the method of using it satisfies claim 32.

As to claims 2, 4, and 35, in one embodiment the beam-manipulating elements **93** are rotatable micromirrors (col. 3 line 67 – col. 4 line 15; claims 1 and 6). As to claim 3, the micromirror devices (DMDs) used by Stafford and disclosed in Hornbeck (US 5061049) are micromachined silicon mirrors.

As to claim 5, the micromirrors are used as shutters. As to claim 6, the shutters may alternatively be liquid crystal shutter elements (col. 4 lines 46-49; claims 1 and 7).

Regarding claim 7, the dispersing element **80** is a prism in the exemplary embodiment, but may alternatively be a transmission grating (col. 3 lines 61-63).

Claims 18-27, 29 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stafford in view of Tobias as applied above, further in view of Braun et al.

Stafford does not describe a beam focuser that focuses the dispersed channels onto the corresponding beam-manipulating elements **93**. However, it would have been obvious to a person having ordinary skill in the art to provide lenses to focus the respective channels onto the input end of the corresponding fibers **92** (which ultimately conducts the associated channel to its beam-manipulating element) since it is well known that the transmission efficiency of an optical fiber is extremely sensitive to misalignment, and since the core diameter of an optical fiber is usually much smaller than the outer diameter of the fiber. It would be especially important to maximize the power coupled into the fiber for each channel when the device is used to measure

the relative intensity of the channels. Furthermore, the use of lenses to couple light into optical fibers is routine in the art.

Stafford also does not disclose a polarization separator or rotator as required by claims 18 and 36. Braun discloses a general technique for handling signals with orthogonal polarizations as described above. It is noted that while a prism may not be as polarization-sensitive as a grating, it would still be important to have the polarization components properly aligned when passing through LCD shutters, which are used in an alternative embodiment of Stafford and which are typically polarization-sensitive. In another alternative embodiment, a grating may be used instead of the prism as noted above. Therefore the technique taught by Braun would be useful in achieving proper orientation of the polarization components of an input signal in the Stafford device. Accordingly it would have been obvious to a skilled person to provide a polarization splitter, a polarization rotator, and an additional spatial light modulator array **90** in the above-proposed Stafford/Tobias combination in order to enable the handling of signals with orthogonal polarizations. The proposed modification and its method of use would have met the limitations of claims 18-27, 29 and 36.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Conclusion

Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 6636306 discloses a spectral analyzer which uses a separate detector **D1/D2** for each polarization component.

Any inquiry concerning this communication should be directed to Mike Stahl at (703) 305-1520 prior to January 12, 2004 or (571) 272-2360 after that date. Official communications which are eligible for submission by facsimile and which pertain to this application may be faxed to (703) 872-9306. Inquiries of a general or clerical nature (e.g., a request for a missing form or paper, etc.) should be directed to the Technology Center 2800 receptionist at (703) 308-0956 or to the technical support staff supervisor at (703) 308-3072.

MJS

Michael J. Stahl
Patent Examiner
Art Unit 2874

AKM ENAYET ULLAH
PRIMARY EXAMINER

December 15, 2003